

### **ABSTRACT**

An apparatus is provided to establish the operating condition of a valve member in a blown film extrusion system. The apparatus includes a controller and it executes program instructions which balance the operating speeds of a supply blower and an exhaust blower of a blown film extrusion system. The controller determines the operating condition of the valve member which places the valve in a linear range of operation.

**1. (CANCELLED)** In a blown film extrusion apparatus in which film is extruded as a tube from an annular die and then pulled along a predetermined path, an apparatus for startup of said extruded film tube, comprising:

- (a) means for varying a quantity of air within said extruded film tube, including:
  - (1) a supply blower which supplies air to said extruded film tube in an amount corresponding to a supply control signal, and
  - (2) an exhaust blower which exhausts air from said extruded film tube in an amount corresponding to an exhaust control signal; and
- (b) a controller member including executable program instructions which define at least one control routine for automatic and coordinated control of said means for varying during starting of said extruded film tube by directing a series of supply control signals to said supply blower and exhaust control signals to said exhaust blower.

**30. (NEW)** In a blown film extrusion apparatus, in which film is extruded as a tube from an annular die and then pulled along a path, an apparatus for startup of said extruded film tube, comprising:

- (a) a blower system for varying a quantity of air within an interior portion of said extruded film tube;
- (b) a controller member including executable program instructions which define a control routine for automatic control of said blower system during starting of said extruded film tube by directing a series of control signals to said blower system; and
- (c) a valve member, under control of said controller, and operatively coupled to said blower system, for varying a quantity of air within said extruded film tube for determining and controlling the circumference of said extruded film tube; and
- (d) wherein said control routine includes a valve optimization routine during which said controller sends control signals to said blower system, in order to establish operating rates for said blower system which allows said valve member to operate in a substantially linear portion of its range of closure conditions.

**31. (NEW)** An apparatus according to Claim 30, further comprising:

- (e) a control interface for receiving operator instructions during startup of said extruded film tube; and
- (f) wherein said controller member further includes program instructions for receiving said operator instructions and integrating said operator instructions into said at least one control routine.

**32. (NEW)** An apparatus according to Claim 31, wherein said operator instructions comprise at least one of: (1) actuation said blower system, and (2) setting of a master speed reference potentiometer.

**33. (NEW)** An apparatus according to Claim 30, wherein said control routine further comprises: a startup routine wherein said controller member initiates operation of said blower system by first initiating operation of a supply blower of said blower system in accordance with at least one supply operating parameter, and then initiates an exhaust blower of said blower system in accordance with at least one exhaust operating parameter.

**34. (NEW)** An apparatus according to Claim 33, wherein said startup routine includes executable program instructions for:

- (1) initially increasing air supplied by said supply blower to said extruded film tube in accordance with a supply ramping function until said extruded film tube is substantially filled; and
- (2) then increasing air exhausted by said exhaust blower from said extruded film tube in accordance with an exhaust ramping function.

**35. (NEW)** An apparatus according to Claim 34, wherein said startup routine further includes executable program instructions for:

- (3) continued increasing operation of at least one of said supply blower and said exhaust blower in accordance with at least one function.

**36. (NEW)** An apparatus according to Claim 30, further comprising:

- (e) at least one transducer for producing a signal corresponding to a detected position of said extruded film tube; and
- (f) wherein said control routine includes instructions for determining whether or not said extruded film tube is within a predetermined range from said at least one transducer.

**37. (NEW)** An apparatus according to Claim 30, wherein said control routine further comprises at least one of the following routines: a blower optimization routine wherein at least one of (1) a supply control signal, and (2) an exhaust control signal is determined at least in part from at least one prior recorded control signal.

**38. (NEW)** An apparatus according to Claim 37, wherein said controller utilizes at least one historical signal and at least one linear model to establish an operating condition for said valve member.

**39. (NEW)** An apparatus according to Claim 37, wherein said controller utilizes at least one prior value for a supply blower to establish an operating condition for said valve member.

**40. (NEW)** An apparatus according to Claim 36, wherein said control routine further includes a bubble break detection routine wherein said signal generated by said at least one transducer is utilized in combination with at least one software timer in order to detect a break in said extruded film tube.

**41. (AMENDED ONCE)** An apparatus according to Claim 30, wherein  
~~said at least one control routine~~ includes:

- (1) a startup routine wherein said controller member initiates operation of said supply blower and said exhaust blower by first initiating operation of said supply blower in accordance with at least one supply operating parameter, and then initiating operation of said exhaust blower in accordance with at least one exhaust operating parameter; and
- (2) a blower optimization routine wherein at least one of (a) said supply control signal, and (b) said exhaust control signal is determined at least in part from at least one prior recorded control signal.

**42. (NEWAMENDED ONCE)** An apparatus according to Claim 41, wherein said ~~at least one control routine~~ further includes:

- (3) a bubble break detection routine wherein a signal generated by a position sensor is utilized in combination with at least one software timer in order to suppress the false detection of a break, and to detect a true break in said extruded film tube.

**43. (AMENDED ONCE)** An apparatus according to Claim 30, wherein said at least one control routine comprises the following routines:

- (1) a startup routine wherein said controller member initiates operation of said supply blower and said exhaust blower by first initiating operation of said supply blower in accordance with at least one supply operating parameter, and then initiating said exhaust blower in accordance with at least one exhaust operating parameter; and
- (2) a blower optimization routine wherein at least one of (1) a said supply control signal, and (2) said an exhaust control signal is determined at least in part from at least one prior recorded control signal;
- (3) a valve optimization routine wherein an operating condition is established for said valve member which sets an operating condition for said valve which places said valve member in linear range of operation.

44. **(NEWAMENDED ONCE)** An apparatus according to Claim 43, further comprising:

- (e) at least one transducer for producing a signal corresponding to a detected position of said extruded film tube;
- (f) wherein said ~~at least one~~ control routine includes a bubble break detection routine wherein said signal generated by said at least one transducer is utilized in combination with at least one software timer in order to detect a break in said extruded film tube.



45. (~~NEW~~CANCELLED) An apparatus for extruding a film tube, comprising:

- (a) a die member;
- (b) means for supplying molten film to said die member;
- (c) a blower system for supplying and exhausting air to said extruded film tube in an amount corresponding to control signal;
- (d) a valve for controlling air flow from said supply blower to said die member in response to a valve control signal;
- (e) a position sensor for providing a signal indicative of the size of said extruded film tube;
- (f) a controller member including executable instructions which define at least one control routine;
- (g) said at least one control routine including:

a valve optimization routine during which, based upon current closure condition of said valve, said controller sends at least one of (a) said supply control signals and (b) said exhaust control signals to at least one of (a) said supply blower and (b) said exhaust blower, in order to establish operating rates which allow said valve member to operate in a substantially linear portion of its range of closure conditions.

**46. (NEWCANCELLED)** An apparatus according to Claim 45, wherein said at least one control routine includes:

- (1) a startup routine wherein said controller member initiates operation of said supply blower and said exhaust blower by first initiating operation of said supply blower in accordance with at least one supply operating parameter, and then initiating operation of said exhaust blower in accordance with at least one exhaust operating parameter; and
- (2) a blower optimization routine wherein at least one of (a) said supply control signal, and (b) said exhaust control signal is determined at least in part from at least one prior recorded control signal.

**47. (NEWCANCELLED)** An apparatus according to Claim 46, wherein said startup routine includes executable program instructions for:

- (a) initially increasing air supplied by said supply blower to said extruded film tube in accordance with a supply ramping function until said extruded film tube is substantially closed; and
- (b) then increasing air exhausted by said exhaust blower from said extruded film tube in accordance with an exhaust ramping function.

48. (~~NEW~~~~CANCELLED~~) An apparatus according to Claim 47, wherein said startup routine includes executable program instructions for:

- (c) continued increasing operation of at least one of said supply blower and said exhaust blower in accordance with at least one function.